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AUTHOR Taylor, Robin
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ABSTRACT

This paper examines the development of computer software in the United States and the processes used by school districts to evaluate software for purchase. Topics considered include major software development trends, development criteria, and production costs; software selection and evaluation, including selection processes, and evaluation and selection criteria; software use in schools including classroom and administrative uses; and the availability of data on the effectiveness of commercially published software. An appendix provides examples of evaluation forms, and 13 references are included. (EW)

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COURSEWARE EVALUATION:

THE U.S. EXPERIENCE

Robin Taylor, PhD

Coordinator, Computer Education
Department of Education
University of Maryland Baltimore County
Catonsville, MD 21228

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COURSEWARE EVALUATION: THE U.S. EXPERIENCE

CONTEXT

The Educational System. In the United States of America, education - as is true of most aspects of society - is, in theory, controlled by the American people. However, various district, county, state, and federal agencies have been empowered to operate the system.

Executive control of all U.S. Public Schools is decentralized and vested in the elected or appointed School Board of individual school districts. (A "district" may be as large as a county or parish - the third level in the nation-state-county hierarchy - or as small as a village or rural township - the fourth level in the hierarchy above.) Large cities usually consist of several administrative districts under a single governing Board of Education.

Most of the 50 states have county Superintendents of Schools. However, in only a few (Florida comes to mind) does this Superintendent run a school district complete with a Board of Education. Rather, his/her office is advisory to local school districts, with no real authority. Sometimes (for example, in Michigan), county offices contract with local districts to provide special services that the individual districts are too small to provide (for example, Special Education for the visually- or hearing-impaired). Administrative control is vested in a Superintendent, various Assistant Superintendents, Supervisors (by curriculum area), Principals (Headmasters), Assistant Principals, and so on.

At the state level, a Department of Education may establish state-wide performance standards, develop curricula, administer grants-

in-aid for special student populations, and - in several states (among them, California, Florida, North Carolina, and Texas) - supervise a complex "adoption" process for instructional materials (chiefly basal textbooks).

The federal Department of Education establishes very broad goals and guidelines for U.S. education systems, but does not have any enforcement power. It also awards grants for major educational projects, such as improving inner-city schools or developing an elementary science program. Local School Board members are informed of federal and state recommendations by correspondence from agencies of those governments and in publications from a national association of school boards.

Curriculum Control. Although both federal and state Departments of Education recommend curriculum goals or changes, all policy decisions related to such recommendations are made by district Boards of Education, after recommendations from and consultation with appropriate administrative officials. Curriculum guides (containing level-by-level objectives, suggested instructional activities, and recommended materials) are then circulated to each school in the district for use by the teachers. Many individual schools may operate with considerable freedom within the general curriculum guidelines that are adopted by the district School Boards.

Purchasing Decisions. Most educational costs are funded through local taxes and special bond issues (many of which have been voted down in recent years). Additional funds are provided by many states at a fixed per-student rate. Some states also make "equalization" payments to poorer school districts.

Each school district must adhere to an approved budget, which includes monies for instructional materials of all types. In all cases, any expenditure of funds is approved by the School Board. Except for minor purchases, most instructional materials are purchased through a central district office - to enable the school district to take advantage of bulk discounts and to minimize confusion. In some districts, each school specifies which materials are to be purchased. (In the so-called "adoption" states, a mass purchase of approved texts is often made by the state. Individual schools then request the desired number of copies from a central book warehouse.)

Some specific projects - microcomputers for inner-city schools, Braille texts for visually-impaired students - are funded, in part, by state or federal grants (usually "seed money"). In those cases (and in only those cases) some control is exercised by the government, and then only in the acceptance or rejection of proposals and in audits of project expenditures.

Many school districts have an Assistant Superintendent or Supervisor of "Instructional Materials" (various titles are used) who is responsible for setting policy and for acquiring materials of an ancillary nature, including hardware and software. A few districts have a Director of Computing (also under various titles) who addresses policy and acquisition only of hardware and software. This person is often an "interested teacher" with part-time teaching responsibilities (except in very large districts). Or it may be a "computer specialist" whom the School Board originally employed to handle administrative computing, and this person then "generalized" to become a specialist in educational computing!

In some school districts, any consideration of hardware and software is done by district-wide, or even building-by-building,

committees of administrators, teachers, and, often, parents. Other districts give individual directors, schools, or teachers small budgets (on the order of $300 U.S. per teacher) to acquire additional ancillary materials for their classrooms each year. Money for the development of courseware, although rare, is also administered by the district School Board.

SOFTWARE DEVELOPMENT & PRODUCTION

Major Development Trends. Over half of commercially published didactic courseware in the U.S. is aimed at the elementary school market (kindergarten through grade 8), with courseware for secondary schools (grades 9-12) comprising most of the balance. Although drill or tutorial programs still account for a large proportion of new courseware, the number of programs in problem-solving or simulation mode is on the increase, especially among publishers of excellent courseware (Taylor, 1986). Also, the quality of many new releases is much better than was the case previously, possibly because publishers are responding to detailed post-production evaluations that were completed for earlier efforts (Wighton, 1984).

For sophisticated software, the language of choice is Pascal - and its use is on the increase. However, a BASIC dialect, often supplemented by machine- or assembly-language routines, is still the most commonly used programming language.

"Working copies" may be made of most applications software, but professional and didactic software is usually copy protected - and often drastically sol To offset this, special site-licence and networked versions

are available from a few publishers for some of their packages. The number of these is increasing, as school systems' purchasing becomes more organized and the demand for such services, concommitantly, increases.

So far, very little courseware has been developed, in any organized fashion, by school systems. Certainly, some individual teachers' efforts - first just locally distributed - have eventually achieved commercial success. (The best-known examples are the simulations, *Odell Lake* and *Oregon Trail*, which are now published by the Minnesota Educational Computer Corporation.) Teacher-developers usually program in a dialect of BASIC and do not use sophisticated copy-protection mechanisms.

Development Criteria. Rather than being based on a needs assessment or market analysis, a publisher's decision to develop a piece of didactic software is usually based on "matching" an already-existing product (such as a textbook), on "an intuitive sense" of what the market wants, or on the personal interest and expertise of the developer. Then, too, when one program is widely accepted, related or similar programs tend to follow. (Cases in point are the popular *Terrapin Logo* and *Bank Street Writer*, for each of which several supporting programs and related materials have been issued.) The concern of commercial software publishers, then, is not "what is good for the schools," but "what the schools will buy."

There is some evidence (Taylor, 1986) of a positive correlation between the production of excellent courseware and a publisher's collaboration with outside "experts," who may very well include practicing teachers. Although it seems as though little money or time is being spent on formative evaluation (Sturdivant, 1984), according to the responses

received in separate studies by Truett (1984) and Taylor (1986), some 60-70% of courseware publishers claim to conduct formative evaluations and to revise materials on that basis. In addition, about 65% of the publishers in Taylor's survey indicated that they validate objectives with teachers, and about 70% said that they also validate instructional sequences with teachers. [*Caution:* Both studies involved small-sample surveys.]

When locally developed (either by individual teachers or by a district), courseware programs are usually created to "do" something (for example, factor large numbers or solve quadratic equations), rather than to "teach" something. Sometimes, these efforts are "published" as program listings in journals or distributed at-cost to other schools in the district. There is essentially no testing of such software beyond debugging, and scrutiny of the program listings reveals that even debugging is limited.

Production Costs. General courseware production costs are difficult to determine, since much of the courseware has been provided as "add-ons" with hardware or with textbooks, and the cost built in to the cost of the basal texts. (*Note:* The "textbook case" now has almost disappeared, as have the electronics divisions of traditional textbook houses.) However, the related factors of "cost" and "time" are the two principal reasons publishers of less-than-excellent courseware give for cutting back on analysis, validation, and testing (Taylor, 1986).

Most single didactic programs sell for about $50 U.S. At this rate, some 3000-5000 copies would have to be sold to cover a developer-publisher's development, production, marketing, and distribution costs.

Conversion. Very little instructional software is imported into the U.S. To a great extent, this situation exists because of the incompatibility of various microcomputer brands, because of wide variation in curricula among countries, and because so very much "home-grown" software is already available here. A little instructional software is imported "as is" from other English-speaking nations, such as Canada, Great Britain, and Australia. An even smaller amount is imported and adapted by the U.S. representative of a foreign publishing house.

SELECTION & EVALUATION

Software Information. There are many sources of information about instructional software. The major evaluation projects cited below provide their evaluations either through on-line databases (as in the case of MicroSIFT) or by mail for an annual fee (as with EPIE). Several states operate "clearinghouses" that disseminate information about software (including evaluations) to local schools.

General software availability is identified annually in *TESS: The educational software selector* (EPIE Institute, 1986), which also includes useful information about hardware requirements, cost, and preview or return options. A more limited selection of highly recommended software is identified and briefly described in the annual publication *Only the best: The discriminating software guide for preschool-grade 12* (Mattas, 1986). And there is a publication just for parents - *The yellow book: A parent's guide to educationally sound courseware* (NEA Educational Computer Service, 1985). Publishers also freely distribute their catalogs to potential buyers.

Software Distribution. Some instructional software is supplied "free" as ancillary materials to accompany basal textbooks. The remainder is competitively marketed by commercial distributors, and may be bought "in bulk" by School Boards. As site licensing and networked versions become more readily available, district Boards of Education are becoming more deeply involved in the acquisition of instructional software and its distribution to local schools.

Selection Process. Much courseware is selected solely on the basis of teacher preference which, in turn, is usually determined by a combination of catalog descriptions and reviews in teacher magazines such as *Electronic Learning, Arithmetic Teacher,* or *Science Teacher.* This is unfortunate, because catalog descriptions are often misleading, especially with regard to the mode of didactic software (for example, a "tutorial" may simply be "practice with feedback" and incorporate no instruction at all!) and the management features included (for example, "student records" may hold only the result of the most recent program run for one student!). Rarely, a preview copy of the instructional package is obtained and "screened" before the decision to purchase is made.

The School Board usually approves all expenditures for software. Recommendations to the Board come from the Assistant Superintendent (or Director) of Instructional Materials and/or from the Director of Computing (if such exists). When "petty cash" budgets or teachers' "discretionary funds" are used for software purchases (seldom), decisions are made on a school-by-school or teacher-by-teacher basis and may still have to be requested through the School Board. (*Note:* In the "early" days, parent groups often raised money and purchased both hardware and software - a

source of much long-range dissatisfaction with computers in the schools.)

Major Evaluation Systems. So far, very little evaluation of professional and administrative software for schools has been formalized. Most U.S. evaluation efforts have focussed on didactic and applications software.

Because of the wide-spread dissatisfaction with courseware quality, several major courseware evaluation projects have developed in the U.S. Chief among these are the MicroSIFT Project, which is a non-profit, government-sponsored undertaking that operates out of the Northwest Regional Educational Laboratory at the University of Oregon, and Educational Products Information Exchange (EPIE), which is a private, self-supporting endeavor that grew out of an earlier commitment to evaluate "programmed instruction" materials. Also, several evaluation centers are operated by individual state Departments of Education and district School Boards (for example, the States of Minnesota, North Carolina, and Texas, and the School Boards of Baltimore in Maryland, Iowa City in Iowa, and San Mateo County in California). Most such systems have created formalized criteria and formats to which all participating evaluators are supposed to adhere.

Evaluation & Selection Criteria. There is general agreement that any formal courseware evaluation must include testing the program with representative students (Fisher, 1983; Taylor, 1985). Apart from that, a wide range of particular criteria are usually grouped into three categories: content characteristics (for example, accuracy), instructional design (for example, effective feedback), and technical factors (for example,

comprehensive user support materials). These criteria are critical, because a publisher's claims may not be supported by sensitive testing. A single, summative conclusion is also stated (for example, recommend highly, recommend with reservations, or do not recommend).

Most of such formal evaluations are made with reference to a very specific form or checklist. Sometimes, slight variations in the format are developed for certain modes or content, as MicroSIFT has done for science courseware and EPIE has done for programming languages. In spite of well-structured evaluation procedures, the conclusions reached by individual evaluators or by different evaluation projects may differ - sometimes to the extent that one evaluation will highly recommend a program, while another concludes that it should not be used (Taylor, 1986). [Sample evaluation forms are provided in the Appendix.] Evaluations that are prepared for publication in a magazine are often more descriptive than critical, and may not provide answers to detailed questions.

As far as system-sponsored evaluations are concerned, some school districts or counties (for example, San Mateo County Office of Education in California) have developed formal evaluation criteria and have actually used these. However, this is not the typical case, for "intuitive" evaluations based on sales promotions still predominate.

SOFTWARE USE

Computers in Schools. After 15 years, there are still very few microcomputers in U.S. schools - in fact, the overall median ratio of students to computers in Spring 1985 was 42:1 (Becker, 1986a; p.2). Of the six possible school configurations in the country, the "best" student-

computer ratio - 25:1 - was found in junior/senior high schools (grades 7-12), and the "worst" - 60:1 - was found in K-6 elementary schools. And the computers are not used as much as they might be during the 30-35 hours per week most public schools are open. The median use of microcomputers in elementary schools (kindergarten through grade 6) is 15 hours per week, in junior high schools (grades 7-9) is 20 hours per week, and in senior high schools (grades 10-12) is 23 hours per week (Becker, 1986a; p.6).

Not surprisingly, then, students still receive very little exposure to computers. Becker's survey (1986a; p.5) established a median of 0.6 hours of computer use per student per week in elementary schools, 1.1 hours per student per week in junior high schools, and 1.8 hours per student per week in senior high schools.

Computer Applications in Education. Most of the courseware now in schools consists of professional programs - spreadsheets, word-processing packages, database managers - that are commercially produced. The most popular professional packages are *Lotus 1-2-3*, *WordPerfect*, and *dBase III* (all in IBM-compatible versions) and *AppleWorks* (for the Apple II series). Any available applications programs are usually limited-function spreadsheet, database, and programming-language packages that accompany "computer literacy" or programming textbooks, or introductory-level word-processing software.

As far as didactic software is concerned, drill programs (e.g., math "facts" or capital cities) are by far the most readily available in schools. In fact, over 30% of all school microcomputer time is devoted to drill (Becker, 1986a; p.5). Drill packages were the earliest ones produced and, therefore,

the first purchased. (The initial flood of insipid software in drill mode is probably responsible for wide-spread teacher dissatisfaction with computer-assisted instruction.) Fortunately, there is evidence of increasing emphasis on simulation and problem-solving/logic software, both in purchasing and in development.

In the early grades (kindergarten through grade 3), instructional use of computers is most prevalent in mathematics (about 42%) and English (about 40%). In the middle grades (grades 4-8), "computer subjects" (computer literacy, programming, problem-solving) claim the greatest proportion of computer time (about 34%, compared with 28% for mathematics and 25% for English). Finally, in high school (grades 9-12), business subjects account for much of the computer use (about 18%), although computer subjects still draw the greatest time (about 50%; Becker, 1986b; p.6).

Quite a lot of administrative and management software is in use by School Board administrators (for inventory control, purchasing, payroll, and accounts payable). However, very few packages have penetrated individual schools or classrooms. Major exceptions include attendance reporting packages, sports statistical programs, and guidance counseling software. Rare is the classroom teacher who uses software to manage his/her instructional programs and record-keeping.

In-Class Evaluation. Some in-class evaluation is done in conjunction with the post-production evaluations described above, using formalized criteria. More and more courseware publishers are encouraging teachers to take advantage of a 30-day preview period. This gives teachers (or district evaluators) an opportunity to evaluate the software's

usefulness to them and to their students before purchasing it. Other publishers allow schools to return software they don't like for a full refund (within a similar time frame). These two policies are enabling more in-class evaluation of didactic programs than formerly. Because so many teachers are unhappy with earlier purchases, the trend toward pre-purchase, in-class evaluation will probably increase.

Effectiveness. Few data are available about the instructional effectiveness of commercially published software, because most publishers neither conduct effectiveness studies nor publish the results (Truett, 1984). However, scholars are now beginning to conduct their own effectiveness research using commercial software. For example, Perkins and Bass (1984) tested the effectiveness - for improving four thinking skills - of seven commercial problem-solving packages over a nine-week period. They found measurable gains in favor of the software (compared with traditional instruction) for verbal analogies and inductive/deductive reasoning, but not for logical reasoning or word problem analysis.

Becker's periodic surveys, *Instructional Uses of School Computers* (1986a; 1986b; 1986c), also attempt to investigate effectiveness issues, for example, the impact of computer use on student motivation, confidence, and self-discipline (1986b) and various organizational effects within schools such as teachers working together (1986c).

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APPENDIX

Richard — This is a pot-pourri of forms. Select at will.

MicroSIFT form (3 pages)

Nat'l Council of Teachers of Math form (3 pages)

[Forms from EPIE & San Mateo county are not readily available, but can be inferred from enclosed sample evaluations]

"Bumble Plot": evaluations from MicroSIFT, EPIE, & San Mateo that agree it is an excellent program

"U.S. Constitution Tutor": evaluations from MicroSIFT, EPIE, & San Mateo that disagree as to its merit

MicroSIFT evaluation for a science program

EPIE evaluation for a programming language

Note: The MicroSIFT evaluations are copies of microfiche reductions, thus the poor quality. Sorry.

microSIFT COURSEWARE DESCRIPTION

NORTHWEST REGIONAL EDUCATIONAL LABORATORY

Title _____ Version Evaluated _____

Producer _____ Cost _____

Subject/Topics _____

Grade Level(s) (circle) pre-1 1 2 3 4 5 6 7 8 9 10 11 12 post-secondary

Required Hardware _____

Available for Hard Disk? ☐ Yes ☐ No ☐ Unknown Licensing Available? ☐ Yes ☐ No ☐ Unknown

Required Software _____

Software protected? ☐ Yes ☐ No Medium of Transfer: ☐ Tape Cassette ☐ ROM Cartridge ☐ 5¼" Flexible Disk ☐ 8" Flexible Disk

Back Up Policy _____

Preview Policy _____

Producer's field test data is available ☐ On Request ☐ With Package ☐ Not Available

INSTRUCTIONAL PURPOSES & TECHNIQUES

(Please check all applicable):

- ☐ Remediation
- ☐ Standard Instruction
- ☐ Enrichment
- ☐ Assessment
- ☐ Instructional Management
- ☐ Authoring
- ☐ Drill and Practice
- ☐ Tutorial
- ☐ Information Retrieval
- ☐ Game
- ☐ Simulation
- ☐ Problem Solving
- ☐ Other _____

DOCUMENTATION AVAILABLE:

Circle P-(Program) or S-(Supplementary Material)

P	S	Suggested grade/ability level(s)	P	S	Teacher's information
P	S	Instructional objectives	P	S	Resource/reference information
P	S	Prerequisite skills or activities	P	S	Student's instructions
P	S	Sample program output	P	S	Student worksheets
P	S	Program operating instructions	P	S	Textbook correlation
P	S	Pre-test	P	S	Follow-up activities
P	S	Post-test	P	S	Other _____

OBJECTIVES: ☐ Stated ☐ Inferred

PREREQUISITES: ☐ Stated ☐ Inferred

Describe package **CONTENT AND STRUCTURE,** including record-keeping and reporting functions:

(Use back if additional space needed)

(Use back if additional space needed)

microSIFT COURSEWARE EVALUATION

NORTHWEST REGIONAL EDUCATIONAL LABORATORY

Package Title _____ Producer _____
Evaluator's Level and Subject Taught _____
Evaluator Name _____ Organization _____

Date _____ ☐ Check this box if this evaluation is based partly on your observation of student use of this package.

Reviewer Statement of Non-Violation of Copyright

The producer's copyright was respected during this evaluation, and I did not copy or attempt to copy any portion of this package.

Signature _____ Date _____

SA-Strongly Agree A-Agree D-Disagree SD-Strongly Disagree NA-Not Applicable

Please include comments on individual items on the reverse page.

CONTENT CHARACTERISTICS

1. SA A D SD NA The content is accurate. (p. 16)
2. SA A D SD NA The content has educational value. (p. 16)
3. SA A D SD NA The content is free of race, ethnic, sex and other stereotypes. (p. 16)

INSTRUCTIONAL CHARACTERISTICS

4. SA A D SD NA The purpose of the package is well defined. (p. 17)
5. SA A D SD NA The package achieves its defined purpose. (p. 17)
6. SA A D SD NA Presentation of content is clear and logical. (p. 17)
7. SA A D SD NA The level of difficulty is appropriate for the target audience. (p. 18)
8. SA A D SD NA Graphics/color/sound are used for appropriate instructional reasons. (p. 18)
9. SA A D SD NA Use of the package is motivational. (p. 19)
10. SA A D SD NA The package effectively stimulates student creativity. (p. 19)
11. SA A D SD NA Feedback on student responses is effectively employed. (p. 20)
12. SA A D SD NA The learner controls the rate and sequence of presentation and review. (p. 20)
13. SA A D SD NA Instruction is integrated with previous student experience. (p. 29)
14. SA A D SD NA Learning can be generalized to an appropriate range of situations. (p. 29)

TECHNICAL CHARACTERISTICS

15. SA A D SD NA The user support materials are comprehensive. (p. 30)
16. SA A D SD NA The user support materials are effective. (p. 31)
17. SA A D SD NA Information displays are effective. (p. 31)
18. SA A D SD NA Intended users can easily and independently operate the program. (p. 32)
19. SA A D SD NA Teachers can easily employ the package. (p. 34)
20. SA A D SD NA The program appropriately uses relevant computer capabilities. (p. 34)
21. SA A D SD NA The program is reliable in normal use. (p. 35)

QUALITY

Write a number from 1 (low) to 5 (high) which represents your judgment of the quality of the package in each division:

_____ Content Characteristics
_____ Instructional Characteristics
_____ Technical Characteristics

RECOMMENDATIONS

☐ I highly recommend this package.

☐ I would use or recommend use of this package with little or no change. (Note suggestions for effective use below.)

☐ I would use or recommend use of this package only if certain changes were made. (Note changes under Weaknesses or Other Comments.)

☐ I would not use or recommend this package. (Note reasons under Weaknesses.)

Describe the potential use of the package in classroom settings:

Estimate the amount of time a student would need to work with the package in order to achieve the objectives:
(Can be total time, time per day, time range or other indicator.)

Strengths:

Weaknesses:

Other Comments:

SAMPLE SOFTWARE DOCUMENTATION SHEET

PROGRAM NAME: _____

SUBJECT AREA: _____

PROGRAM CLASS

____ isolated program

____ part of a ____ program cluster

INTENDED AUDIENCE(S)

____ teachers

____ students in grade(s) _____

____ other _____

_____

PROGRAM USES: (1=primary; 2=secondary)

__ demonstration
__ drill or practice
__ informational
__ instructional gaming
__ instructional management
__ instructional support
__ problem solving
__ programming utility
__ simulation
__ testing operations
__ tutorial
__ whistles and bells
__ word processing
__ other (_____)

CRITICAL PREREQUISITE SKILLS

_____

_____

NAME(S) OF PREREQUISITE PROGRAM(S)

_____

_____

_____

NAME(S) OF FOLLOW-UP PROGRAM(S)

_____

_____

_____

DATE OF THIS DOCUMENTATION

_____

PROGRAM SOURCE

name: _____

address: _____

_____

_____

phone: _____

program cost: _____

SYSTEM REQUIREMENTS

computer: _____

language: _____

memory needed: _____ bytes

input mode: cassette
____-inch diskette
cartridge
other _____
_____

output mode: color monitor
B/W monitor
printer
plotter
other _____
_____

CLASSROOM VALIDATION (describe)

_____

_____

_____

TIME FOR AVERAGE EXECUTION ____ minutes

OVER

GENERAL DESCRIPTION OF THE PROGRAM (i.e., purpose of the program)

SPECIAL PROGRAM CHARACTERISTICS (e.g., use of graphics or sound, designed for use by groups of two or more persons at a time, level of difficulty can be modified by teacher (only) or student, exit from program is controlled by the teacher (only) or student, etc.)

DIRECTIONS FOR USE OF THE PROGRAM (e.g., directions not presented in the program itself but needed for program execution, directions regarding the use of the program within the total instructional process, notes regarding program options, etc.)

ANCILLARY MATERIALS REQUIRED (e.g., books, worksheets, charts, data lists, dice, geometric shapes, lab equipment, etc.)

ADDITIONAL DOCUMENTATION AVAILABLE (check box for each type)

☐ sample run (location _____)

☐ program listing (location _____)

SOFTWARE EVALUATION CHECKLIST

PROGRAM NAME: _____ SOURCE: _____ COST: _____

SUBJECT AREA: _____ REVIEWER'S NAME: _____ DATE: _____

1. INSTRUCTIONAL RANGE

_____ grade level(s)

_____ ability level(s)

2. INSTRUCTIONAL GROUPING FOR PROGRAM USE

_____ individual

_____ small group (size: _____)

_____ large group (size: _____)

3. EXECUTION TIME

_____ minutes (estimated) for average use

4. PROGRAM USE(S)

_____ demonstration
_____ drill or practice
_____ instructional gaming
_____ instructional management
_____ instructional support
_____ problem solving
_____ programming utility
_____ simulation
_____ testing operations
_____ tutorial
_____ whistles and bells
_____ word processing
_____ other (_____)

5. USER ORIENTATION: INSTRUCTOR'S POINT OF VIEW

low				*high*	
•	•	•	•	•	flexibility
•	•	•	•	•	freedom from need to intervene or assist

6. USER ORIENTATION: STUDENT'S POINT OF VIEW

low				*high*	
•	•	•	•	•	quality of directions (clarity)
•	•	•	•	•	quality of output (content and tone)
•	•	•	•	•	quality of screen formatting
•	•	•	•	•	freedom from need for external information
•	•	•	•	•	freedom from disruption by system errors
•	•	•	•	•	simplicity of user input

7. CONTENT

low				*high*	
•	•	•	•	•	instructional focus
•	•	•	•	•	instructional significance
•	•	•	•	•	soundness or validity
•	•	•	•	•	compatibility with other materials used

8. MOTIVATION AND INSTRUCTIONAL STYLE

passive				*active*	
•	•	•	•	•	type of student involvement

low				*high*	
•	•	•	•	•	degree of student control

none	*poor*				*good*	
•	•	•	•	•	•	use of game format
•	•	•	•	•	•	use of still graphics
•	•	•	•	•	•	use of animation
•	•	•	•	•	•	use of color
•	•	•	•	•	•	use of voice input and output
•	•	•	•	•	•	use of nonvoice audio
•	•	•	•	•	•	use of light pen
•	•	•	•	•	•	use of ancillary materials
•	•	•	•	•	•	use of _____

9. SOCIAL CHARACTERISTICS

present and negative	*not present*	*present and positive*	
_____	_____	_____	competition
_____	_____	_____	cooperation
_____	_____	_____	humanizing of computer
_____	_____	_____	moral issues or value judgments
_____	_____	_____	summary of student performance

Bumble Plot

VERSION: 1982

PRODUCER: The Learning Company
4370 Alpine Road
Portola Valley, CA 94025

EVALUATION COMPLETED: May 1983 by the staff and constituents of TIES, Roseville, Minnesota

COST: $39.95

ABILITY LEVEL: Grades 3 through 8
SUBJECT: Mathematics
TOPIC: Arithmetic
MEDIUM OF TRANSFER: 5-1/4 in. disk
REQUIRED HARDWARE: 48K Apple II or Apple IIe, disk drive, monitor (preferrably color)
REQUIRED SOFTWARE: Applesoft, DOS 3.3
INSTRUCTIONAL PURPOSE: Enrichment
INSTRUCTIONAL TECHNIQUES: Drill and practice, game, problem solving

DOCUMENTATION AVAILABLE: Suggested grade/ability level(s), sample program output, program operating instructions, student's instructions, student worksheets, follow-up activities.

INSTRUCTIONAL OBJECTIVES: Through problem solving games, the student will learn the concept of working on a grid.

INSTRUCTIONAL PREREQUISITES: It is assumed that the student has had previous experience with negative numbers.

CONTENT AND STRUCTURE: The package consists of one disk, a small manual, and nine activity cards in a hard cardboard folder. The program includes five games starting with a number line and progressing to a 10 x 10 grid using both positive and negative numbers.

ESTIMATED STUDENT TIME REQUIRED: The time needed to run a game would depend on age and ability of user, but one might allow at least 15-20 minutes per activity.

POTENTIAL USES: The package would be appropriate for individual or small group use for drill and practice or problem solving activities.

MAJOR STRENGTHS: The activities provide good practice in using coordinates with negative numbers. "Bumble Art" offers a chance for creative expression which is rare for software. "Road Block" is a highly motivational exercise in problem solving using coordinates.

MAJOR WEAKNESSES: The rewards for achieving goals could be better. With all the delightful graphics and sound in the introductions, the printed words, "YOU GOT IT" as a reward are a let down.

EVALUATION SUMMARY

SA	A	D	SD	NA	
•					Content is accurate.
•					Content has educational value.
•					Content is free of stereotypes.
		•			Purpose of package is well defined.
	•				Package achieves defined purpose.
	•				Content presentation is clear and logical.
•					Difficulty level is appropriate to audience.
•					Graphics/sound/color are used appropriately.
•					Use of package is motivational.
•					Student creativity is effectively stimulated.
	•				Feedback is effectively employed.

SA	A	D	SD	NA	
	•				Learner controls rate and sequence.
	•				Instruction integrates with prior learning.
	•				Learning can be generalized.
		•			User support materials are comprehensive.
	•				User support materials are effective.
•					Information displays are effective.
•					Users can operate easily and independently.
•					Teachers can employ package easily.
	•				Computer capabilities are used appropriately.
•					Program is reliable in normal use.

SA - Strongly Agree A - Agree D - Disagree SD - Strongly Disagree NA - Not Applicable

Evaluators indicated that they would highly recommend this package.

Northwest Regional Educational Laboratory
300 S.W. Sixth Avenue • Portland, Oregon 97204
(503) 248-6800

This evaluation is based on the evaluations of three or more reviewers who are representative of potential users of the courseware package.

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Mathematics

Bumble Plot

The Learning Company

HARDWARE CONFIGURATION (*used for analysis)

Apple II* 48K DOS 3.3 Color Monitor
Apple II Plus 48K DOS 3.3 Color Monitor

COMPONENTS **PRICE**

1 Disk, 12-page Manual $60

PRODUCER

The Learning Company
4370 Alpine Road
Portola, CA 94025
415-851-3160

USERS SPECIFIED BY PRODUCER

Ages 8-13
Individuals or pairs
Must be able to read directions
(BUMBLE GAMES, a complementary program for ages 4-10, available separately)

CURRICULUM ROLE

Math
Supplemental
Educational Gaming

CONTENT TOPICS

Graphing skills: Using positive and negative numbers to name points in quadrant grids/ Plotting number pairs
Five games: Trap and Guess/ Bumblebug/ Hidden Treasure/ Bumble Art/ Roadblock

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1982

AUTHOR

Leslie Grimm

OVERALL RATING OF INSTRUCTIONAL DESIGN 9/10

OVERALL RATING OF SOFTWARE DESIGN 9/10

ANALYSTS SUMMARY January 1983

BUMBLE PLOT makes excellent use of the capabilities of the computer to enhance the presentation of content. Graphing skills are developed in a gaming approach. BUMBLE PLOT expands on the skills and content of the complementary program, BUMBLE GAMES. They are designed for different age groups with some overlap, but can be used independently.

Contents are well taught and the approach is motivating. For classroom use, however, placement strategies and means of evaluation would have to be devised by the teacher.

The manual that accompanies the program contains an overview of each game, but developer's rationale and objectives statements are not included (they are found on the packaging), nor are suggestions for integrating the program into a basic curriculum. There are no instructional suggestions.

RECOMMENDATIONS TO THE PRODUCER

1. As an instructional material, placement strategies and a way to evaluate the learning of the content should be included.
2. A teacher's guide should include rationale and objectives statements and suggestions for use with students. Integrating the program into a basic curriculum should be addressed.
3. Clarify the directions in the game Roadblock. An option to review directions without interfering with the progress of the game would be helpful.

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Bumble Plot

INSTRUCTIONAL & SOFTWARE DESIGN

Goals & Objectives

* Goals & Objectives well supported by Contents

Developer's Rationale

"Plotting number pairs is a basic math skill for the computer age. Children need this skill to understand and build charts and graphs, to locate places on a map and to design computer graphics."

Development Evidence

"Developed with math specialists and evaluated with children."

Learner Objectives

Inferred from package:

EXAMPLES

To use positive and negative numbers to name point in quadrant grids

To plot number pairs

Contents

* Five programs (games) increase in difficulty

User Appropriateness
Readability level may be too high for some children

Excellent presentation of content

Excellent use of graphics

Accuracy and Fairness
No errors of factual presentation, spelling, or grammar

No controversial content or social biases

Clarity
Directions to students are clear except in the game Roadblock

Display formatting and character legibility are clear

Example of how to play each game is available

Cues and prompts are effective

Graphics
Appealing color graphics represent ball, arrow, tin can, ivory comb...

Color used to enhance and reinforce content

Audio
Enhances the program; can be turned off

Methods & Approach

* Gaming approach as it is executed in this program enhances content

Technical Quality
No programming errors

Easy to use

90-day replacement warranty

Documentation/Teacher's Guide
Good technical explanations

No instructional suggestions

No suggestions for integrating the program into a basic curriculum

Support Materials
None

User Control
Menu lists the 5 games

Student can review instructions or skip them

Student can exit at any time

Student controls rate of frame display

Feedback
Immediate

Deductive reasoning approach, does not remediate; does use cues, prompts

EXAMPLES

Correct: "You have found a rusty tin can."

Incorrect: "There is a roadblock at this position. Check your coordinates."

Random Generation
Used in activities

Evaluation & Management

* Evaluation does not measure Goals & Objectives

Tests

None

Branching

None

Records/Management

None

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BUMBLE PLOT

D E S C R I P T I O N:

PUBLISHER: The Learning Company
SYSTEM: Apple II, II+*, IIe, 48K;
TRS-80 Color Computer, 48K; BASIC
PRICE: $39.95
PERIPHERALS NEEDED: disk drive
BACKUP COPY: for fee from publisher
NETWORK/HARD DISK: no

SUBJECT: Math
GRADE: 3-8
USER: individual
SCOPE: single concept
CONTENTS: one disk, manual
PROGRAM TYPE: problem-solving, tutorial, educational game

PROGRAM DESCRIPTION:
This program teaches students about negative numbers, coordinate graphing, and number lines. A series of five games introduces the concepts in order of difficulty: Trap and Guess, Bumblebug, Hidden Treasure, Bumble Art, and Roadblock. In each game, the student tries to guess Bumble's secret number, and the computer provides clues. Students know how to plot ordered pairs of numbers into all four quadrants of a coordinate graph by the conclusion of the fifth game.

E V A L U A T I O N: 2 Reviewers

OVERALL OPINION

OPINION:	REVIEWER BACKGROUND:
(2) Great program. I recommend it highly.	Middle school math teacher; Special education resource teacher

EVALUATION CRITERIA

	Excellent	Good	Weak	Not Acceptable
General Design	2			
Content	1	1		
Ease of Use	2			
Motivational Devices	2			
Documentation	1			

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TEACHER COMMENTS

STRENGTHS: "Great graphics. Really encourages thinking skills while students are getting practice in plotting points." "Dynamic graphics, fun music for rewards, systematic levels of teaching."

CONCERNS/PROBLEMS: None noted.

SUGGESTIONS TO AUTHOR/PUBLISHER: "Super."

STUDENT RESPONSE

High school special education students would make mistakes initially but would improve significantly after practice. They really enjoyed the program and found it exciting. The last program, however, was too hard for most of the students.

O T H E R R E V I E W S:

Compute (Jan. 1983) +
Softalk (Jan. 1983) +
Booklist (Jan. 1, 1983) +
EPIE (1983) +
Creative Computing (April, 1983) +
User's (Nov. 1982) +

U.S. Constitution Tutor

VERSION: Apple

PRODUCER: Micro Learn a Division of MicroLab, Inc.
2699 Skok ie Valley Road
Highland Park, IL 60035

EVALUATION COMPLETED: June 1984 by the staff and constituents of Region 10 ESC, Houston, Texas

COST: $35.00

ABILITY LEVEL: Grades 7 through postsecondary
SUBJECT: Social Studies
TOPIC: Amer ican Government
MEDIUM OF TRANSFER: 5-1/4 in. disk
REQUIRED HARDWARE: 48K Apple II, single disk drive, monitor. Also available for Commodore 64, IBM-PC/PC jr.
REQUIRED SOFTWARE: Applesoft, DOS 3.3
INSTRUCTIONAL PURPOSE: Standard instruction, enr ichment, assessment
INSTRUCTIONAL TECHNIQUES: Drill and pract ice, tutorial

DOCUMENTATION AVAILABLE: In program — program operating instructions, student's instructions. In supplementary materials — suggested grade/abil ity level(s), instructional objectives, program operating instructions, teache r's information, resource/reference information, student's instructions, follow-up activities.

INSTRUCTIONAL OBJECTIVES: (STATED) To provide content on U.S. government and the U.S. Constitution so that students will understand the concepts and procedures of Amer ican government and thereby improve citizenship. To provide content on U.S. government and the U.S. Constitution to prepare students for required tests. To provide practice in taking multiple-choice tests under non-stressful conditions. To improve thinking skills: classification of ideas, analysis, synthesis, mak ing generalizations, drawing inferences, etc.

INSTRUCTIONAL PREREQUISITES: (STATED) Prior knowledge of concepts in American government and the U.S. Constitut ion.

CONTENT AND STRUCTURE: This package consists of multiple-choice questions which are arranged both by subject and by level of difficulty. If studied by subject (Legislat ive, Executive, Elections, etc.) users will find the questions arranged with h each menu topic. The easier questions will come first, and the exper ience is like a lesson. If studied by diff iculty level (Beg inner, Intermediate,

Continued on back

EVALUATION SUMMARY

SA	A	D	SD	NA		SA	A	D	SD	NA	
•					Content is accurate.	•					Learner controls rate and sequence.
•					Content has educational value.	•					Instruction integrates with prior learning.
•					Content is free of stereotypes.		•				Learning can be generalized.
	•				Purpose of package is well defined.	•					User support materials are comprehensive.
	•				Package achieves defined purpose.	•					User support materials are effective.
•					Content presentation is clear and logical.		•				Information displays are effective.
•					Difficulty level is appropriate to audience.		•				Users can operate easily and independently.
	•				Graphics/sound/color are used appropriately.	•					Teachers can employ package easily.
	•				Use of package is motivational.		•				Computer capabilities are used appropriately.
				•	Student creativity is effectively stimulated.	•					Program is reliable in normal use.
•					Feedback is effectively employed.						

SA - Strongly Agree A-Agree D-Disagree SD - Strongly Disagree NA - Not Applicable

Evaluators indicated that they would highly recommend this package.

Summary: Scale from 5 (High) to 1 (Low).
Content: 5, Instructional Characteristics - 4.5, Technical Characteristics - 4.5.

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U.S. Constitution Tutor, continued

Advanced) the subject matter will be more "mixed up," but the experience will be like a test. Topics included are Legislative Branch, How a Bill Becomes a Law, Executive Branch, Elections, Judicial Branch, Amendments, Constitutional Principals, and Rights.

ESTIMATED STUDENT TIME REQUIRED: 4 to 5 hours.

POTENTIAL USES: This package provides relevant information which could be used as review or reinforcement pertaining to the Constitution and Legislative Branches. The package could be used with individuals, small groups, or in large group situations. It could be used as a tool for discussion.

MAJOR STRENGTHS: All the material is very well organized and planned. The concepts are presented clearly and with varying levels of difficulty. The feedback is immediate and appropriate.

MAJOR WEAKNESSES: The delay while the computer retrieves the next question is too long.

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Social Studies

U.S. Constitution Tutor

Microlab

HARDWARE CONFIGURATION (*used for analysis)

Apple II	48K	DOS 3.3	Applesoft
Apple II Plus, IIe*	48K	DOS 3.3	
Commodore 64	64K		
IBM PC, PCjr	128K	PC-DOS	

COMPONENTS

1 Disk, 49-page User's Guide, 4-page Procedural Directions Guide

PRICE

$35.00

WARRANTY

30-day replacement; $5.00 per backup disk thereafter

PRODUCER

Micro Lab, Inc.
2699 Skokie Valley Road
Highland Park, IL 60035
312-433-7550

CURRICULUM ROLE

Social Studies
Supplemental
Drill & Practice
Tutorial

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1983

AUTHOR

Douglas Shawhan

USERS SPECIFIED BY PRODUCER

Elementary School Students
Junior and Senior High School Students
College Students
Appropriate for Teacher Certification and Citizenship Requirements
Individuals
Small Groups

CONTENT TOPICS

U.S. Constitution:
- 3 Branches of Government
- How Bills Become Law
- Elections
- Amendments
- Constitutional Principles
- Constitutional Rights

OVERALL RATING OF INSTRUCTIONAL DESIGN 7/10

OVERALL RATING OF SOFTWARE DESIGN 7/10

ANALYSTS' SUMMARY October 1984

U.S. CONSTITUTION TUTOR gives a lot of well-explained information about the constitution in a straightforward, if uninteresting, approach. The program is suitable for students in junior high school and beyond who are preparing for tests on the United States Constitution. It provides good control over the presentation of material (e.g., questions can be skipped), and valuable explanatory feedback is available after every response, whether correct or incorrect. EPIE analysts note, however, that there are no graphics to enliven the activity and that the frame format does not change. Consumers looking for a more motivating, enjoyable learning experience should find another source of instruction.

There are ten topics with an average of 18 multiple-choice questions each: "How a Bill Becomes Law," "Executive Branch," "Elections," "Amendments," "Rights," Legislative Branch," Judicial Branch," and Constitutional Principles" (the last two have two sections each). Users can have information presented at one of three difficulty levels. Questions at the lowest difficulty level center on the presentation and recall of facts, while questions at the highest level relate to concepts and require inference.

Once a topic or level is chosen, the user selects the tutorial mode or test mode. In the tutorial mode, an explanation is automatically provided after every response to multiple-choice questions. Users can also choose to see explanations of why the remaining three choices are incorrect answers. Built into the program are 27 "help" screens that elaborate on major points of the program. These screens are available to the user for 80 percent of the questions in the program. When a "help" screen is available and the student answers the question incorrectly on the first attempt, the screen is automatically displayed. The current question number and total number of questions in that section are shown so that users can skip to a specific question in the section.

The test mode for each section presents the same questions as in the tutorial portion but without feedback or help screens. After all questions have been answered, the user sees a percentage score. Missed questions are repeated in the tutorial mode.

The user's guide is helpful. It contains two additional quizzes (with answers) and a bibliography for further study.

RECOMMENDATIONS TO THE PRODUCER

1. Enliven the presentation of material to engage less motivated learners.
2. Provide corrective feedback after each question in the test mode.
3. Provide or suggest a means of recording test scores.

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U.S. Constitution Tutor

INSTRUCTIONAL & SOFTWARE DESIGN

Goals & Objectives

* The program objectives are supported by the content

Developer's Rationale

"Whether you are a . . . student . . . a teacher, future citizen or just interested in a more thorough understanding of the U.S. Constitution, this tutorial will help you increase your knowledge and your test score."

Development Evidence

None

Learner Objectives

4 program objectives are stated:

EXAMPLES
"To provide content . . . so that students will understand the concepts and procedures of American government . . . ."

"To provide content . . . to prepare students for required tests . . . ."

"To provide practice in taking multiple-choice tests under non-stress conditions . . . ."

SAMPLE ITEM
The student sees the following question and must select choice number 2:
"Congress does not have the power to:
1) coin money
2) pass bills of attainder
3) declare war
4) punish piracy and crimes committed on the ocean
5) levy and collect income taxes"

Contents

* 10 topics, each with an average of 18 questions, which can be used in either a "tutorial" or "test" mode

User Appropriateness

The dry program format makes it best suited for use as test preparation rather than as a vehicle for encouraging interest

Overall readability of the program is at about a seventh grade level

3 levels of difficulty available

Accuracy and Fairness

No errors of fact, usage, or grammar noted

The score report has a punctuation error: "YOU HAD 7 OUT OF 16 QUESTIONS CORRECT THAT IS 44%"

Clarity

On-screen prompts are limited to explaining special keys (e.g., "S" to skip a question); the directions in the 4-page procedural guide are clear

Support Materials

The user's guide contains a 50-item fill-in-the-blank and short-answer quiz and a 50-item matching quiz; answers for both tests are provided

Methods & Approach

* Approach provides ample user control over the presentation of material, but is dull and repetitious

Technical Quality
After an item appears on the screen, the disk must be read before an answer can be selected; this can be frustrating for items that take less time to answer than the disk access time

Documentation/User's Guide
Organization of content, use of help screens, and special keys are clearly explained; a brief but helpful section on "study aids" and a bibliography are also provided; the help screens are reproduced in the guide

User Control
Explanations for each multiple-choice answer can be seen, questions can be skipped, and the user can choose to view questions in the tutorial or test mode; help screens are available for 80 percent of the questions; users can exit or return to the main menu at any time

Feedback
In tutorial mode, feedback is immediate and explanatory after each response; when available, help screens are displayed after first incorrect response

In test mode, no feedback is given after a response; score is shown after all items have been answered; missed items are repeated in tutorial mode

Graphics
Text is in upper and lower case and is single spaced

Audio
A beep signals an invalid entry

Random Generation
Answer choices are listed randomly

Evaluation & Management

* The two 50-item quizzes in the user's guide can be effectively used to measure learning

Tests

The test mode of the program allows students to answer the questions for any section without receiving immediate feedback; missed questions are then repeated in the tutorial mode

The two 50-item tests in the user's guide effectively measure real understanding of the material by using several types of questions (fill-in-the-blank, short answer, multiple choice, and matching)

Branching

Missed questions in the test mode are repeated in the tutorial mode where students can see explanations of all possible answers

Records/Management

After completion of a section (in either the tutorial or test mode), students see how many questions they answered correctly on the first try out of the number of questions attempted

Scores cannot be printed out or stored on disk

U.S. CONSTITUTION TUTOR

DESCRIPTION:

PUBLISHER: Micro Lab
SYSTEM: Apple II, II+*, IIe, 48K; BASIC
PRICE: $30.00
PERIPHERALS NEEDED: disk drive
BACKUP COPY: for fee from publisher (free replacement if damaged)
NETWORK/HARD DISK: by arrangement with publisher

SUBJECT: U.S. History
GRADE: 4-12
USER: individual
SCOPE: single concept
CONTENTS: 1 disk, manual
PROGRAM TYPE: drill and practice, educational game, logic and problem solving, testing, tutorial

PROGRAM DESCRIPTION:

This program provides instruction and testing on aspects of the Constitution--amendments, laws, election rules. Three different levels of difficulty are available. The testing section presents multiple choice questions and reports students' scores. The tutorial section provides immediate feedback and instructions when answers are incorrect.

EVALUATION: 3 Reviewers (all students)

OVERALL OPINION

	OPINION:	REVIEWER BACKGROUND:
1	Pretty good, useful.	11th grade history student
2	OK, but you might wait for a better one.	two 11th grade history students

EVALUATION CRITERIA

	Excellent	Good	Weak	Not Acceptable
General Design		2		
Content	3			
Ease of Use	2			
Motivational Devices		2	1	
Documentation	1	2		

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TEACHER COMMENTS

STRENGTHS: One student reported, "This program strengthened my knowledge of the Constitution by reminding me of facts I had forgotten. Excellent factually. I encourage more students to use this game. It will probably help on tests." "Subject is helpful."

CONCERNS/PROBLEMS: "If we knew more about the Constitution and courts, we would have liked it better. I don't think a computer can take the place of a teacher. I am sure a computer could not answer all our questions, but a teacher could and even if he couldn't, he would know where to find the answer." "Too much like a test. More competition is necessary."

SUGGESTIONS TO AUTHOR/PUBLISHER: "Well-done." "They could make better graphics. It was like a regular test that we take in our classrooms."

STUDENT RESPONSE

One student said, "Some questions were mixed with others, and I thought the answer was that of another. We realized the right answer when the answers were given. This was helpful."

OTHER REVIEWS:

Softalk (Nov. 1981) Mention only
Microcomputers in Education (June 1982) ?

This report made possible by a grant from SOHIO Corporate Contributions

The criteria used for this evaluation have been customized to accommodate SCIENCE courseware

The Incredible Laboratory

VERSION: Atari

PRODUCER: Sunburst Communications
39 Washington Avenue,
Suite RMS
Pleasantville, NY 10570

EVALUATION COMPLETED: June 1984 by staff and constituents of Oakland ISD, Pontiac, Michigan.

COST: $55.00

ABILITY LEVEL: Grades 4 through post-secondary.
SUBJECT: Science
TOPIC: Process
MEDIUM OF TRANSFER: 5-1/4" disk
REQUIRED HARDWARE: Atari 800 or 800XL, single disk drive and monitor. Also available on the Apple II and Commodore 64.
REQUIRED SOFTWARE: Atari Basic
INSTRUCTIONAL PURPOSE: Standard instruction, enrichment.
INSTRUCTIONAL TECHNIQUES: Game, problem solving.

SCIENCE PROCESSES INVOLVED: Acquiring information, organizing information, interpreting information, using the Scientific Method. Inferring, hypothesizing.
SCIENCE CONCEPTS INVOLVED: Quantification, cause-effect, interaction, change, model, significance, validation.

DOCUMENTATION AVAILABLE: In program -- student's instructions. In supplementary materials -- suggested grade/ability level, instructional objectives, prerequisite skills/activities, sample program output, program operating instructions, teacher's information, resource/reference information, student's instructions, student worksheets, follow-up activities.

INSTRUCTIONAL OBJECTIVES: (STATED) To help students to use trial and error and other strategies as tools in problem solving. To enable students to practice note taking by making organized lists of information.

INSTRUCTIONAL PREREQUISITES: (STATED) The user's manual contains six lesson plans containing teacher notes and worksheet materials for classroom use. These lessons are in a sequential order and the prerequisite for one

continued on back

EVALUATION SUMMARY

SA	A	D	SD	NA	
				●	Content is accurate.
				●	Content represents current knowledge of subject.
	●				Science issues presented objectively.
●					Content has educational value.
●					Science processes well integrated into package.
●					Content is free of stereotypes.
●					Purpose of package is well defined.
	●				Package achieves defined purpose.
	●				Content presentation is clear and logical.
	●				Difficulty level is appropriate to audience.
	●				The package makes good use of computer time.
●					Graphics/sound/color are used appropriately.
●					Use of package is motivational.

SA	A	D	SD	NA	
●					Student creativity is effectively stimulated.
●					Feedback is effectively employed.
●					Learner controls rate and sequence.
	●				Instruction integrates with prior learning.
	●				Learning can be generalized.
	●				User support materials are comprehensive.
	●				User support materials are effective.
	●				Package components are durable.
●					Information displays are effective.
●					Users can operate easily and independently.
●					Teachers can employ package easily.
●					Computer capabilities are used appropriately.
●					Program is reliable in normal use.

SA - Strongly Agree A-Agree D-Disagree SD - Strongly Disagree NA - Not Applicable

Evaluators judged that the cost of the package is reasonable compared to its instructional value.

Evaluators indicated that they would use or recommend this package with little or no change.

Summary: Scale from 5 (High) to 1 (Low).
Content - 5, Instructional Characteristics - 4, Technical Characteristics - 5.

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This evaluation is based on the review of three or more reviewers who are representative of potential users of the courseware package

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lesson is the preceding lesson. The first lesson has no prerequisites stated other than a fourth grade reading level.

CONTENT AND STRUCTURE: The package contains one program disk, a backup disk and a user's manual.

Students playing THE INCREDIBLE LABORATORY use trial and error to discover how various chemicals combine to create colorful and unusual monsters. Each chemical determines a variation of one of the monster's body parts — the head, eyes, arms, body, legs or feet. In the higher skill levels, chemicals have changing properties and may be combined to create entirely new variations.

The INCREDIBLE LABORATORY has three main sections: Novice, Apprentice, and Scientist. The Apprentice and Scientist sections are divided further into two sub-levels each.

All three sections and their sub-levels contain both a Play and a Challenge mode. In the Play mode, students try to determine the effects of the chemicals: they form and test hypotheses by creating monsters with different chemical compositions. In the Challenge mode, they use their conclusions to competitively build and recognize monsters.

POTENTIAL USES: As an exercise in observation, deduction and thinking, this program would be best used with individuals to learn how to use the program then with pairs to work on the challenge. It is also effective as a single focus large group activity. It would be useful in presenting students with an opportunity to make organized lists and practice information gathering - skills needed in scientific work.

ESTIMATED STUDENT TIME REQUIRED: Allow from 30-40 minutes per session for up to five consecutive days.

MAJOR STRENGTHS: The program has very good documentation with some worthwhile class activities that complement and smoothly lead into the use of the software. The lesson plans for using the software are also outstanding. While interest of middle school students was high for a short time, they quickly were frustrated and interest dropped sharply after about 15 minutes of student-directed interaction with the program. Classroom lessons were then introduced and worked through. After three days, students were again involved with the program at a very high enthusiasm level that lasted 40 minutes. When class ended, about half the class stayed to continue with the program. The graphics are very good and interesting - as well as the feedback on predictions.

The program allows students to use combinations of choices to achieve different results. Students discover how each variable affects the final results. The various levels and play/challenge option give the program versatility in use for a number of grade and ability levels.

MAJOR WEAKNESSES: After data is keyed, the time it takes for the flask to boil off and the monster to form seems to be longer than necessary. The students become very impatient with the process. It might be nice to add a technique such as "speed-up" key to shorten the time needed to produce a monster.

Students could get carried away with "creating" various types of monsters on strictly trial and error basis if there is not strict teacher control on computer time and lesson objectives.

Eleventh grade students and above may not find the exercise as interesting as younger students.

OTHER COMMENTS: The objectives could be better reached if the program is not used as a "game".

While the science content of this program is fiction, the problem solving content is accurate and current.

Northwest Regional Educational Laboratory
300 S.W. Sixth Avenue • Portland, Oregon 97204
(503) 248-6800

This evaluation is based on the evaluations of three or more reviewers who are representative of potential users of the courseware package

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Computer Languages

Krell Logo/Terrapin Logo

MIT Logo Group

DEVELOPER
MIT Logo Group

DISTRIBUTORS

Terrapin Inc.
380 Green Street
Cambridge, MA 02139
617-492-8816

Krell Software, Inc.
1320 Stony Brook Road
Stony Brook, NY 11790
516-751-5139

HARDWARE CONFIGURATION
64K Apple II, IIe, II+ or Franklin Ace
Disk Drive with Controller
Color Monitor

TERRAPIN PACKAGE COMPONENTS
Logo Language Diskette
Utility Diskette
Terrapin Logo Tutorial

TERRAPIN PRICE
$149.95

KRELL PACKAGE COMPONENTS
Logo Language Diskette and Backup
Utility Diskette
Tutorial Diskette
MIT Technical Manual, *Logo*
Wall Chart
Logo Journal subscription

KRELL PRICE
$89.95

FEATURES OF TERRAPIN LOGO AND KRELL LOGO

Terrapin Logo and *Krell Logo* each use the original Logo language developed at MIT. Their Logo features are the same. The two versions differ only in the documentation and support materials that are included, and in their package prices.

The evaluation of Logo features below applies to both Terrapin and Krell versions. The evaluations of their documentation and support materials follow, and are separate for each version.

Turtle Commands/Turtle Graphics

The Terrapin/Krell versions of Logo have all of the standard commands for moving the turtle across the screen (but not the WINDOW command for moving it off the screen). The turtle responds quickly to all commands typed in by the student.

Important features that are missing from the Terrapin/Krell versions of Logo are: easy-to-use commands for erasing, built-in commands for drawing circles and arcs, and simple procedures for directing programs to wait for specified times. While it is possible for students to write their own procedures for these things, it is time consuming and awkward to do so, since these procedures have to be put into the computer's memory each time they are used.

Splitscreen, Fullscreen, and Textscreen Modes

Students can switch back and forth among the splitscreen, fullscreen, and textscreen modes relatively easily with two-key commands, such as <CTRL> F to move to fullscreen. The design of Apple hardware precludes the use of single-function keys for these commands.

Color Options

Due to the limits of the Apple computer, these versions of Logo only support six colors, including black. In addition, there are occasional "bleeding" effects produced by the combination of certain pencolors and certain background colors.

Animation Capacity

The Terrapin/Krell versions of Logo do not include sprites, although it is possible to purchase additional items that will support sprites for the Apple computer. These include a sprite board that goes inside the computer and a diskette with special instructions for controlling the movement of the sprites. These packages usually cost several hundred dollars.

Very simple animation is possible by causing the turtle's shape to change. Programs to accomplish this are on the utility diskette, but only experienced Logo programmers will be able to make use of them.

Saving and Printing Logo Pictures

These versions of Logo allow students to store turtle drawings on diskette with the SAVPICT command and retrieve them with the READPICT command.

Printing drawings onto paper is more complex, and depending on which printer is being used, may require some advanced knowledge to accomplish.

Special Features for Using Logo with Young Children and Special Needs Students

The utility diskette included with these versions contains the INSTANT procedures that allow children to use single-stroke commands to manipulate the turtle and to save and recall programs.

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Krell Logo/Terrapin Logo

The utility diskette also has the TEACH program, which allows students to define procedures outside of the Logo editor.

TCL is another useful program for young or disabled students that is included on the utility diskette. The TCL program can be used to direct the Terrapin Turtle Robot, a floor robot that can draw lines as it moves across the floor.

Word and List Processing

Full-scale word- and list-processing is possible with these versions of Logo. All the commands necessary to write interactive games, quizzes, tutorials, and programs that can teach the computer by increasing its knowledge base (such as ANIMAL) are included.

However, some helpful tools for creating such interactive programs are not built into the Terrapin/Krell versions of Logo. There is no procedure such as WAIT, and some useful primitives for word and list manipulation are missing.

Error Messages

Most error messages are clear. However, younger children would benefit from more specific messages. For example, if a student types FORWARD but forgets to specify the distance the turtle should move forward, the computer responds only with:

NOT ENOUGH INPUTS

A better message would tell the student which "input(s)" are missing, as in:

I DON'T KNOW HOW FAR FORWARD TO GO.

Debugging Options

Included on the utility diskette is the very helpful TRACE command, which allows students to watch a program being executed step by step.

Editing Features

The Terrapin/Krell versions of Logo contain all the standard Logo editing features. Using the control key in conjunction with various letter keys accomplishes the editing functions, such as <CTRL> K to "kill," or delete, a line.

Music Capacity

The procedures for creating music are on the utility diskette supplied with either of these versions of Logo. Students will need to have an advanced understanding of both Logo and music theory to make use of them.

Arithmetic Operations

The Terrapin/Krell versions of Logo have built-in primitive procedures that make it possible for students to perform arithmetic operations on both integers and decimals. It is also possible to determine sines, cosines, and square roots. Students can use Logo to graph functions of the form Y = f(X).

Available Memory

11.5K bytes

MATERIALS INCLUDED IN THE TERRAPIN LOGO PACKAGE

Documentation

The Terrapin version includes a comprehensive book, *Terrapin Tutorial*, which is divided into a tutorial text in the front and a technical manual in the back.

Most of the chapters in the tutorial section are well written, allowing a novice to work through the tutorial page by page. The graphics chapter is exceptionally clear and is appropriate both for teachers and students.

The explanation of how to use Logo for word and list processing is not clear. There are virtually no instructions to help students or teachers learn how to write interactive programs.

The music chapter is written for users with advanced knowledge of music and programming.

The technical manual includes information on a variety of advanced topics, such as assembly language interfaces and useful memory addresses. Advanced knowledge of computer systems and computer programming is necessary to make use of most of the technical manual.

Other Materials in the Terrapin Logo Package

The utility diskette that is supplied in the Terrapin package is the same as that supplied with the Krell package. The following programs are representative of those available for beginning and intermediate Logo users. (Programs are also available for advanced users.)

INSTANT and TEACH: Simplified programming for young students
ARCS: Programs for drawing arcs and circles
TRACE: A debugging tool that shows students the values of variables as a procedure is running
SHAPE.EDIT: A program for changing the shape of the turtle
TCL: Programs for controlling a floor robot
Music: A set of procedures to write and run Logo music

MATERIALS INCLUDED IN THE KRELL LOGO PACKAGE

Documentation

One book is included in the Krell Logo package, the MIT technical manual, *Logo*, which is a difficult reference even for advanced programmers.

Other Materials Included in the Krell Package

The Krell Logo package also includes a backup diskette, a utility diskette, a tutorial diskette, a wall chart, and a "journal" subscription.

The utility diskette is the same as is supplied with the Terrapin package (see description above).

The tutorial diskette, *Alice in Logoland*, is intended to demonstrate sample programs and teach programming novices how to write Logo programs. However, it is unclear in parts and does not provide enough information; novices cannot learn Logo programming from this tutorial.

The wall chart lists Logo commands and abbreviations and shows sample Logo programs.

A subscription to the *Logo Journal* is included in the Krell package. The journal has no publication schedule.

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